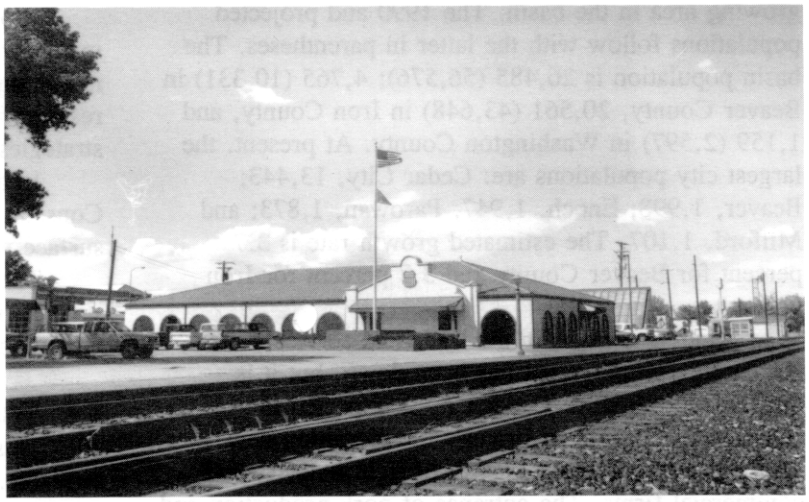
Section 2 Contents

Section 2 State Water Plan - Cedar/Beaver Basin

Executive Summary

This section summarizes the *Cedar/Beaver Basin Plan*. Like the *State Water Plan*, this document contains 19 sections. Also, Section A, Acronyms, Abbreviations and Definitions, and Section B, Bibliographies, have been added.

Besides the 19 sections, the *State Water Plan* contains Section 20, "River Basin Summaries", and Section 21, "Annual Status Reports." The following headings are titles of each of the sections summarized. These sections should be studied for more detailed information.



Union Pacific Railroad Office in Milford

2.1 Foreword

Within the broad responsibility to enhance the quality of life and general welfare of its citizens, the state of Utah has the specific obligation to plan for and encourage the best use of its resources. The *State Water Plan* (1990) provides the statewide foundation and direction. More detailed plans are and will be prepared for the 11 hydrologic basins. The *Bear River Basin Plan* was published in January 1992, and the *Kanab Creek/Virgin River Basin Plan* was published in August 1993. This plan for the Cedar/Beaver Basin is the third report to be completed.

The purpose of this plan is to identify potential conservation and development projects and describe alternatives to satisfy the problems, needs and demands. The final selection of alternatives will be made at the local level.

2.3 Introduction

Section 3 contains the general planning guidelines used to insure continuity during plan preparation. The guidelines consist of guiding principles, purpose, organizational structure and review process. The organizational arrangements provide contribution and review opportunities for state and federal agencies, special interest groups and, especially, local entities, organizations and individuals. The planning process allows for review and approval at various stages of completion. This section also discusses the settlement, climate, general characteristics and land status of the Cedar/Beaver Basin.

The Cedar/Beaver Basin is part of the Sevier Lake Region, which is part of the larger Great Basin Region which is a closed basin. The Cedar/Beaver Basin drains into the Sevier River which terminates in the normally dry Sevier Lake Playa. There are 3.6 million acres in the basin.

Mean annual valley temperatures vary from 48° to 51° F. Summer temperatures often reach 100° F. Precipitation ranges from eight inches in the west

desert areas to 40 inches in the high mountains. Elevations range from 4,600 feet to 12,173 feet above sea level.

The lofty Tushar Mountains and colorful Markagunt Plateau on the east are in marked contrast to the rugged mountain ranges and environment of the western part of the basin. The federal government administers nearly two-thirds of the total area and the state administers about 8 percent. About 26 percent of the land is in private ownership. Tribal lands. amount to about 1 percent.

2.4 Demographics and Economic Future

Population, employment and the economy are discussed in this section. Cedar City is the most rapidly growing area in the basin. The 1990 and projected populations follow with the latter in parentheses. The basin population is 26,485 (56,576); 4,765 (10,331) in Beaver County, 20,561 (43,648) in Iron County, and 1,159 (2,597) in Washington County. At present, the largest city populations are: Cedar City, 13,443; Beaver, 1,998; Enoch, 1,947; Parowan, 1,873; and Milford, 1,107. The estimated growth rate is 3.7 percent for Beaver County and 3.7 percent for Iron County.

Major growth is in the trade and service sector. Agriculture employment has been down, but it is expected to rebound. Cedar City is expected to continue its aggressive strategy for recruiting new business, resulting in a growth of light industry and commercial firms. The entrance of pork production and processing in the Milford area will significantly strengthen agricultural employment and income.

2.5 Water Supply and Use

Section 5 discusses the historical water supplies and present uses. The surface water supplies are estimated primarily from two stream gages. They indicate the long-term annual flows are 38,116 acre-feet for the Beaver River near Beaver and 24,637 acre-feet for Coal Creek near Cedar City. The highest flows in the Beaver River were about 88,000 acre-feet and about 62,000 acre-feet for Coal Creek, both in 1983. The average annual groundwater discharge from wells is about 188,700 acre-feet.

Total water diversions are: irrigation, 318,790 acre-feet; culinary, 8,810 acre-feet; and secondary, 3,330 acre-feet. Total depletions are 185,320 acre-feet. Wetland and riparian vegetation uses are not included.

2.6 Management

The water supply is generally well-managed to serve the various uses. About 65 percent of the total water supply is managed by a combination of 77 irrigation companies. The 19 existing lakes and reservoirs are used to help manage the surface water resources. The culinary water supply comes from groundwater. The major present concern is deteriorating water quality.

2.7 Regulation/Institutional Considerations

Responsibility for water regulation rests primarily with two state agencies. These are the Division of Water Rights and the Department of Environmental Quality.

Proposed determinations of water rights have been made for all areas of the basin. Groundwater is the major supply to satisfy the needs of the basin. This has resulted in the need for groundwater management strategies.

In addition, water quality is always a concern. Constant vigilance is needed to maintain the quality of surface water and groundwater.

There are 13 high hazard dams in the basin. The state engineer is currently assessing the condition of these dams.

2.8 Water Funding Programs

This section discusses the funding programs available. Funding can be either grants or loans at various interest rates. These funding resources are available for all kinds of water-related proposals.

The time periods reported by the agencies vary but the total funds expended are impressive. The state and federal grants are nearly $14 million and loans are over $45 million for a total of $59 million. Strikingly, the amount of loans is three times the amount of grants. Data from local sponsor funding, including private financial institutions, are not available.

2.9 Water Planning and Development

Section 9 discusses the water resources problems and needs. Development and management alternatives are described for surface water and groundwater.

The only issue discussed concerns long-range planning. Long-range planning is important because of the many state, federal and local agencies and entities involved. The extensive use of groundwater in this basin, more so than in any other basin in the state, also presents opportunities for long-range planning.

Irrigation water shortages can be critical, especially for users with only direct flow rights. Some irrigators supplement their supplies with groundwater, especially in the drier years. Where there is reservoir storage, supplies last longer into the late part of the irrigation season. Surface water supplies most of the irrigation water in Beaver Valley, the Minersville area and Parowan Valley. The Milford area, Cedar Valley and the Beryl-Enterprise area depend more on groundwater. Culinary water demands are expected to increase by 72 percent or about 6,160 acre-feet by the year 2020. All of the supplies come from springs or the groundwater reservoirs. Secondary systems can save culinary water for this higher use. The demand for secondary water by the year 2020 will increase by about 800 acre-feet. This does not consider addition of more systems. Current depletions for wetlands is about 25,410 acre-feet. There is a need for improvement of habitat of fish and wildlife. Some of the waterfowl areas have dried up over the years. The Cedar/Beaver Basin is becoming more popular for people seeking recreational experiences. This is going to increase the demand on the natural resources as well as on man-made water-based facilities. Making more efficient use of existing water supplies increases the availability for future demands. This can be accomplished by increasing use efficiency, water conservation and protection of existing supplies. There is the possibility of surface water storage. There are 10 potential reservoir sites that may be utilized in the future if conditions change to make them feasible. Management of the groundwater reservoirs is one of the most important ways to maintain the existing supply from this source. Transbasin diversions are a possibility, but not likely, in the foreseeable future.

Depletions for all uses will increase by about 4,000 acre-feet by the year 2020. Culinary water uses will account for 3,200 acre-feet of this increase, but needed supplies will likely be converted from agricultural uses. Agricultural uses will stay about the same or decrease slightly.

2.10 Agricultural Water

This section discusses the agricultural aspects of the basin. Agricultural activities are an important part of the economy. Water shortages are a problem.

There are 110,810 acres of irrigated cropland which depletes about 178,740 acre-feet of water, mostly for the production of alfalfa. The cropland irrigation water deficit on currently cropped land is only about four percent of the consumptive use. If all of the existing irrigated cropland (including idle land) with a valid water right were to receive a full water supply, an additional 44,000 acre-feet of water would be depleted. Cropland is only 3 percent of the total basin area, although much of the basin contains arable soils. They cannot be cropped because they lack irrigation water or sufficient precipitation. The number of farms has decreased over the years, but the average farm size has doubled, containing about 1,000 acres.

Over 90 percent of the basin area is used for grazing purposes producing about 325,000 AUMs annually. Wildlife utilizes about 11,000 AUMs and 8,000 AUMs are allocated for wild horses on land administered by the Bureau of Land Management. The Forest Service estimates about 10 percent of the total AUMs are used by wildlife.

There are critical (accelerated) erosion areas throughout the basin. These areas are eroding at over three times the background geologic rate.

There are various alternatives for solving problems including canal lining and pipelines, reservoir storage and rangeland improvement measures. Increasing resource use efficiencies is a viable option.

Shakespeare Theater in Cedar City

2.11 Drinking Water

Section 11 discusses the drinking water systems, their problems and the future needs. The systems are publicly or privately owned. Groundwater is the only current culinary water supply, either from springs or underground reservoirs. The basin-wide use is 272 gallons per capita per day (GPCD). This is higher than the state average of 265 GPCD. The GPCD use in the

cities and towns ranges from 143 in Parowan to 464 in Minersville. The use rate for other public community systems ranges from 107 at Rainbow Ranches to 518 at New Castle (this was before New Castle installed a secondary system). Most of the communities have adequate culinary water sources to meet future needs. Some communities will have to enlarge their system delivery capacity to meet projected needs.

There are 21 public community water systems in the basin and 22 public non-community systems. Nineteen of the public community systems have an approved rating, one is pending corrective action and one is not approved. Most public water suppliers expect an increased demand in the next 20 to 30 years. Cedar City increased its delivery by 47 percent from 1981 to 1991 and expects this to double by the year 2020. It is expected all future needs will be satisfied from groundwater sources. This will come from transfers of water from irrigation to culinary uses.

2.12 Water Quality

Section 12 discusses the water quality of the basin along with the problems and needs. Most of the water in the basin is of good quality. The quality of some surface water streams carries high sediment loads during periods of high spring snow-melt runoff and when high intensity summer convection storms occur. Three reservoirs have been classified as eutrophic. In general, the quality of the surface water has stayed about the same over the last number of years while the groundwater quality has deteriorated.

Funds have been received for a Non-point Source Demonstration Project on the Beaver River between Beaver City and Minersville Reservoir. This will complement a Clean Lake Project underway on Minersville Reservoir.

Coal Creek yields more sediment than any other stream in the basin. Low flows only carry 200 to 500 mg/l, but one flood flow of 1,200 cfs yielded sediment at a rate of 2.3 million tons per day or a total dissolved solids concentration of nearly 700,000 mg/l. In comparison, Beaver River yields concentrations of about 1,200 mg/l. Groundwater quality is good in the Beaver Valley with the highest values reaching 1,000 mg/l. Concentrations in the Milford area are up to 4,600 mg/l in the north end of the groundwater reservoir. There was a peak of 875 mg/l in Parowan Valley in 1973, but it is usually about half that amount. Some of the wells in Cedar Valley reached up to 2,100 mg/l, but those supplying culinary water are below the recommended limits. A few wells in the Beryl-Enterprise area reached 1,000 mg/l, but most are below 500 mg/l. A monitoring program is needed to obtain data to help manage the groundwater reservoirs.

2.13 Disaster and Emergency Response

Flood hazard mitigation and disaster response are discussed in Section 13. It also discusses the problems and needs. Flooding and drought are the major water-related emergencies.

Some of the local entities have hazard mitigation and disaster response plans. All local governments need these type plans with staff ready in order to reduce damages and save lives. It is much easier to be ready for an event than to try and correct the problems after the fact.

Floodplain management can help alleviate problems in the future. All of the counties in the basin participate in the National Flood Insurance Program and all cities should. The counties also have disaster response plans in place. Cities and towns without these plans should prepare them to be ready for future emergencies. Floods of various sizes have occurred in all parts of the basin, the most recent occurring in Fiddlers Canyon north of Cedar City producing a peak flow of 4,080 cfs.

Droughts are always a recurring problem, aggravating most of the basin, particularly on the south and west where at low elevations the winter snow packs are small.

2.14 Fisheries and Water-Related Wildlife

Section 14 discusses the fish and wildlife resources of the basin along with the problems, needs and some alternative solutions. The range in the environment varies from areas above the timber line and alpine to the semi-desert of the western part of the basin. Species of wildlife are varied according to their environments. There are 22,000 acres of wetlands/open water and riparian areas. The only wetland managed specifically for waterfowl is the Clear Lake Waterfowl Refuge in the northern part of the basin. The Cedar City Upland State Game Sanctuary is in the northern part of Cedar Valley.

Many people are attracted to live and play in the area because of the unique year-round attractions. Summer homes are being constructed in the upper watershed areas. This is creating problems and conflicts in use of the resources. With a growing population, problems will increase in the future. There are areas where damage is caused by ATV travel, other recreational uses and dewatering of streams.

Water-related mitigation alternatives include maintenance of native fish communities and habitat or replacement of these values with similar facilities. One way to protect riparian areas from livestock and wildlife is to provide watering facilities upland from streams. Riparian area re-growth can be accelerated by construction of low head dams, rock weirs, streambank protection, sediment traps and vegetative plantings.

2.15 Water-Related Recreation

The importance of recreation and related facilities is presented in Section 15 along with problems and needs. Recreation is becoming a larger part of the basin's lifestyle. The area offers a diversity of outdoor recreational opportunities. There are two state parks, one national monument, two national forests, one wilderness area, four byways, two backways and many camping areas, RV sites and trails in the basin. Other points of interest include Old Cove Fort, Old Irontown and the Jefferson Hunt Historical Site. There are two ski resorts along with golf courses and swimming pools around the basin. Nine projects have been assisted through the federal Land and Water Conservation Fund program, three in Beaver County and six in Iron County. Total grant funds amounted to $224,800 and $321,000, respectively, in these two counties.

Surveys have been conducted to determine the recreational and environmental issues. It was noted that over 50 percent of all tourists visiting Utah pass by Cedar City and Beaver on I-15. More of them need to be made aware of local attractions. Many of the most requested facilities were water-related.

Red Creek Reservoir

2.16 Federal Water Planning and Development

Section 16 describes the federal involvement in basin planning and development. The federal role is changing. Many of the past activities concerned development of the resources. Concerns now are more oriented around conservation and protection.

The main concern is the part federal agencies should play compared to state and local involvement. Coordinated planning and use is definitely needed. With the large amount of land area administered by the federal government, local needs and desires become even more important.

The largest construction projects by federal agencies was the Minersville and Green's Lake Watershed projects carried out by the Natural Resources Conservation Service (Soil Conservation Service). The Corps of Engineers completed project work on Big Wash near Milford and on Shoal Creek near Enterprise. The corps completed flood control studies on Coal Creek near Cedar City and another study covering most of the basin. Other federal activities are the many and varied programs carried out to assist the local people. These include technical assistance as well as financial grants and loans.

2.17 Water Conservation/Education

The importance of water conservation along with the need for and ways of conserving this resource are discussed in Section 17. Water conservation can alleviate the effects of drought by stretching available supplies. A system-wide long-term conservation program can extend the need for developing additional water supplies. Conservation can also carry communities through short-term emergencies. Installing secondary systems for outside uses can reduce the need for increased high quality water supplies. In the long term, water education is the key to conservation through more efficient use.

The basin population is expected to increase from about 26,500 in 1990 to 56,600 in 2020, an increase of nearly 115 percent. Without conservation, this growth will require an additional 9,170 acre-feet of culinary water. There is a need for agricultural water throughout the basin. However, it will be difficult to develop additional supplies.

Water conservation will require the input and support of the public. If everyone believes in water conservation, it will happen.

2.18 Industrial Water

Section 18 discusses the industrial water use in the basin. There is relatively little water used for industrial purposes other than light industrial operations. Most of these industries are supplied from existing municipal and industrial water supplies delivered through systems now in place.

There are six hydroelectric power plants now in operation; four on the Beaver River and one each on Center Creek and Red Creek. Two geothermal plants produce power in the basin; one at Roosevelt Springs near Milford and one at Sulfurdale.

A large greenhouse near New Castle uses geothermal and cold groundwater. Other industrial users include Cache Valley Cheese in Beaver and Circle Four Hog Farms and Continental Lime Company near Milford.

Heavy industry is not expected to increase. Light industry is being attracted to the area in increasing numbers. There are potential hydroelectric sites, but it is unlikely these will be developed in the near future.

2.19 Groundwater

Groundwater supplies and use and related problems are discussed in Section 19. Groundwater supplies about one-half of the agricultural needs and all of the municipal and industrial water. This includes springs used for culinary water supplies. The groundwater in the Cedar/Beaver Basin is more fully developed than in any other area in Utah. One of the concerns is protection of recharge areas, primarily the alluvial fans of tributary streams.

The Cedar/Beaver Basin consists of six structural basins containing unconsolidated deposits which form the primary aquifers. These are Upper Beaver Valley, Milford Valley of the Escalante Desert, Lower Beaver Valley, Parowan Valley, Cedar Valley and the Beryl-Enterprise area of the Escalante Desert. The alluvial fill in each of these forms an essentially isolated groundwater reservoir.

In the Beaver Valley, there is 55,600 acre-feet of recharge to the groundwater reservoir. About half the total discharge of 56,200 acre-feet comes from springs. The balance is from wells. There are about 4 million acre-feet of recoverable reserves. The water quality is generally good, although there are areas of poorer quality water in the basins.

Milford Valley receives most of its recharge from infiltration from irrigation, although some of the 58,000 acre-feet comes from the Beaver River. The total discharge is 81,000 acre-feet, mostly from wells. There are about 10 million acre-feet of recoverable reserves. There has been some long-term decline in the water table which has caused land subsidence locally. The quality of the water is generally good, but there are areas of poorer quality. Many wells show a long-term downward trend in water quality.

The recharge in Parowan Valley is about 40,000 acre-feet, mostly from Parowan, Red and Summit creeks. The discharge is 43,000 acre-feet; about half which is from wells. There are about 4 million acre-feet of recoverable reserves. The water quality is generally good.

Cedar Valley is similar to Parowan Valley. Coal Creek is the primary contributor to the groundwater recharge of 40,000 acre-feet. The discharge is about 44,000 acre-feet with a little over half of this from wells. The water table decline was decreased when most of the basin was closed for further drilling of wells in 1940. There are about 4 million acre-feet of recoverable reserves. The groundwater is hard but satisfactory for most uses. The water in the southwest and northeast parts of the basin is better quality than most of the rest. This is where Cedar City obtains a large share of its culinary water supply. There is danger of poorer quality water infiltrating the better quality water if a cone of depression were created by overpumping.

The recharge to the Beryl-Enterprise groundwater basin is about 48,100 acre-feet, mostly from Shoal and Pinto creeks. The discharge is 88,000 acre-feet resulting in a long-term decline in the water table of less than two feet per year. Withdrawal from wells is about 76,300 acre-feet annually. There are 16,000 million acre-feet of recoverable reserves. The water quality is generally good with some small areas of poorer quality. The groundwater quality is slowly deteriorating. ■ ■